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RISK MANAGEMENT AS A FACTOR OF INCREASING OF COMPETITIVENESS AND MORE EFFICIENT SUPPLY CHAIN MANAGEMENT

Abstract:*Modern business conditions brought the increasing demands of consumers, uncertainty in the market and consequently significant changes in the supply chain business. In response to these conditions that includes the great number of risks, it has been shown that the efficiency of supply chain management is related to the level and adequacy of the implemented risk management system in the direction that efficiency of the supply chain management increases with the level and adequacy of the implemented risk management system as well as that the implementation of an adequate risk management system in the supply chain is necessary to maintain the competitiveness of the supply chain market. The aim of the paper is to point out the importance of introducing a quality and adequate risk management system in all supply chain companies as a significant factor of competitiveness and more efficient supply chain management.*

Keywords: *Competitiveness, Logistics, Risk management, Supply chain management.*

1. Introduction

Modern business environments are clearly defined by globalization, so far unprecedented technological development speed and completely changed pace of change in business conditions, certainly bring completely new challenges and definitions of performance, as well as business in modern conditions and in each of the individual components of modern business processes. In such an environment, which an enterprise can consider as a default variable, supply chain, and supply chain management, there have been significant changes in the last fifty years. It can be said that this is a significant change in supply chains due to the influence of globalization, which has led to increasing consumer demands, but at the same time increased uncertainty in supply-chain markets. Namely, in light of the mentioned change of supply chain management conditions, with a particular focus on the positive but also the negative aspects of the simple and rapid availability of almost all information, a significant level of uncertainty in all parts of the supply chain, as a company response, the need for a more efficient supply chain management and precisely by introducing an effective risk management system has emerged. It has to be said that with globalization, there have been new and numerous risks that the supply chain management process is additionally exposed to, and that risk management as an inescapable component of effective supply

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chain management has become even more important. Within the research topic and in order to define the basic work problem, the following hypotheses have been set:

H1 The supply chain management efficiency is linked to the level and adequacy of the implemented risk management system aimed at maximizing the security of the transfer of the goods, services or information from the beginning to the end point of the destination in the direction that the efficiency of supply chain management increases with the level and adequacy of the implemented risk management system.

H2 Implementation of an adequate supply chain risk management system is necessary to maintain the competitiveness of the supply chain market.

H3 A supply chain that has implemented an adequate risk management system will have fewer negative consequences due to the greater possibility of timely risk recognition and timely action in the direction of reducing negative consequences.

The methods used are methods of analysis, synthesis and comparison method, as well as methods of collecting secondary sources of research. The aim of the paper is to point out the importance of introducing a quality and adequate risk management system in all supply chain supply companies as a significant factor in competitiveness and more efficient supply chain management as well as contributing to raising awareness of this problem.

2. Supply Chain Management

The very definition and scope of the concept of logistic has changed significantly since the ancient until present time. Mentz et al. (2001) define logistics as a process of planning, deploying and verifying the success of creating and storing goods, services and relevant information from the point of departure to the point of consumption, all in accordance with customer requirements. Thus, logistics integrates all logistical activities that help move products from raw materials to end-users. American Logistics Business Council sees logistics as a process of planning, implementing and verifying the success of the actual flow and warehousing of goods, services and relevant information from the point of departure to the place of consumption, all in accordance with customer requirements. The European Commission (European Commission 2018) considers logistics to be a fundamental part of supply chain management, which consists of an organization and management of asset flows related to the purchase, production, storage, distribution and disposal, reuse and exchange of products, as well as providing services with added value. One of the broader definitions (Christopher, 1999) states that logistics is planning of orientation and frameworks designed to create a plan for product and information flow through a business process while supply chain management is built on that framework and requires linkage and coordination between processes of all supply chain participants. Christopher also among the first mentioned the fact that the companies have not yet recognized the vital impact that supply chain management can have on achieving competitive advantage (Christopher, 1999).

Waters (2007) sees the supply chain as a series of activities and organizations that enable the movement of materials from the initial supplier to the end user, and following this definition, Russell-Walling (2011) defines the supply chain as a series of sequentially related organizations and activities together involved in creating and producing a product, and consequently believes that a suitable term for this chain would also be the value chain, as each subsequent supply chain participant adds a new value to the product. The value chain activities are divided into primary and supporting activities, and the competitive advantage derives from the way that an organization organizes and performs these activities within a value chain, i.e. the company must deliver value to its clients by

performing these activities more efficiently than its competition or performing them in a unique way that creates greater differentiation compared to competition (Christopher, 1999) According to Porter (in Balderston, 1985), each company should, after analysing all activities in the value chain (Figure 1), decide on outsourcing those activities with no competitive advantage, which is now almost apparent in every industry.

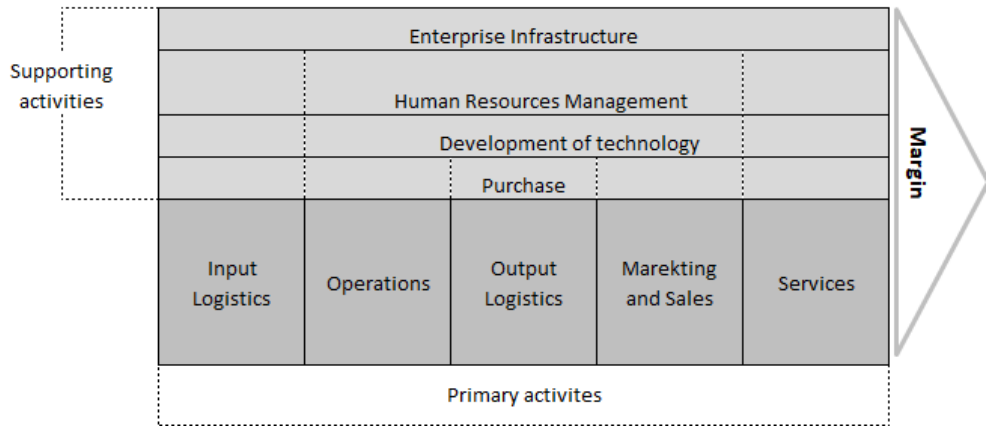


Figure 1. The Value Chain according to Porter (in Balderston, 1985)

All of this indicates that when it comes to the supply chain, it is actually about important financial assets. This is also supported by the data from the European Logistics Market study on the estimated value of logistics operations in the European Union which was estimated at 878 billion euros in 2012 (European Commission 2018).

It can be said that the supply chain can be seen as a link between the market and the supplier or logistical package that covers the entire organization (Christopher, 1999), from the management of the raw material through delivery to the final product, as shown in the Figure 2.

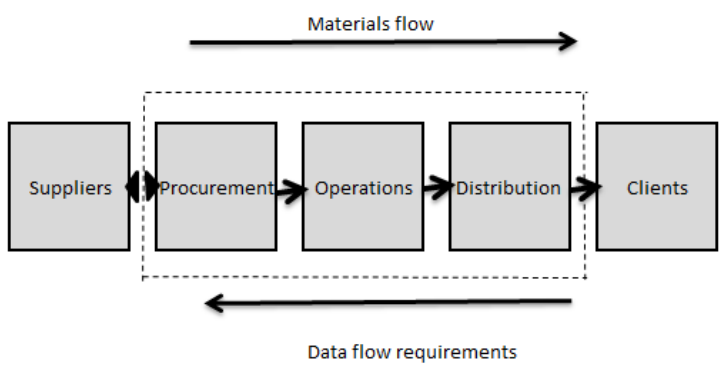


Figure 2. The Supply Chain Management Process according to Christopher (1998)

In the literature dealing with this issue, there is a large number of definitions of logistics, supply chains and supply chain management, however, all of them contain some common elements. Emphasis is made at the way inwhich the supply chain is co-ordinated in order to synchronize supply at all levels, exchange and share information with the aim

of increasing innovation, shortening the product development cycle, reducing delivery time, costs, and at the end of efficient and fast responses to demand as well as increased service levels for end consumers (Russell-Walling, 2011). Some authors, besides mentioned elements, emphasize the flow of information, and it is said that supply chain management integrates organizational units throughout the supply chain and coordinates material, financial and flow information with the same ultimate goal - meeting end-user demand, with emphasis and task improving the competitiveness of the entire supply chain (Stadtler, 2005). It is also worth mentioning the discussion about the relationship between logistics and supply chain management, where several streams can be observed. Namely, logistics and supply chain management are considered as the same activities, which are very difficult to observe separately because they have a common goal: to deliver the right product at the right time, to the right place, in the right condition and with acceptable costs. A large number of authors clearly distinguish logistics from supply chain management, whereby one considers supply chain management to be broader than logistics (Giunipero and Brand, 1996), while other see logistics as broader concept. Some authors (Larson and Halldorsson, 2004). observe logistics and supply chain management as completely different terms. However, it can be noticed that supply chain management definitions present an element of management of certain activities in the area of product development or some financial elements, while the existing logistic definitions do not contain these elements. In addition, supply chain management, unlike logistic goals, is often aimed at increasing competitiveness, suggesting that, considering the existence of many common elements such as the supply process itself or the application of appropriate techniques for planning and realizing the process itself, supply chain management is, however, a wider concept of logistical concept.

Of course, in addition to all the above mentioned, it is undisputed that, with all the benefits and advantages that the modern way of doing business has brought, the increasing number of risks to which the entire chain supply chain management process is exposed in the realization of numerous logistic activities is exposed, with the imperative of continuous increase of competitiveness on market, has led to the need for introducing systematic risk management in the supply chain.

3. Risks and risk management according to the norm ISO 31000

The risk can generally be seen as an effect of uncertainty on the planned goals, either positive or negative, with goals that can be defined at different levels - from financial, health, safety to strategy, organization, project, process or product (ISO 31000:2009). Risk Management is the process of identifying, assessing and prioritizing risks associated with coordinated and economical use of resources to minimize, monitor and control the probability and/or the impact of unpleasant events (Hubbard, 2012)., or activity focused on direct control over risk-based organization which is based on the ISO 31000: 2009 standard for organizational planning for the design, implementation, review and continuous improvement of risk management through the organization (ISO 31000:2009). The value of ISO 31000: 2009 (ISO 31000:2009) is that it is the result of best practice in the area of risk management.

The risk management process according to ISO 31000: 2009 is presented in the Figure 3.

In the risk management process according to the ISO 31000 standard (ISO 31000:2009), Communication and Consultation refers to communication with all stakeholders at every stage of the risk management process and consideration of the process as a whole.

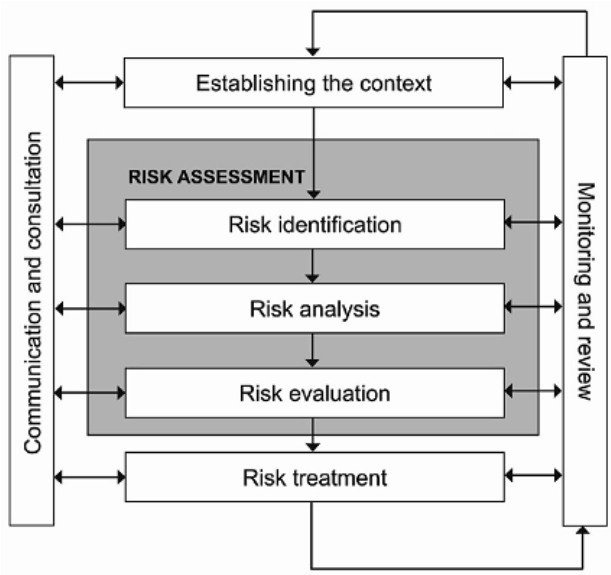
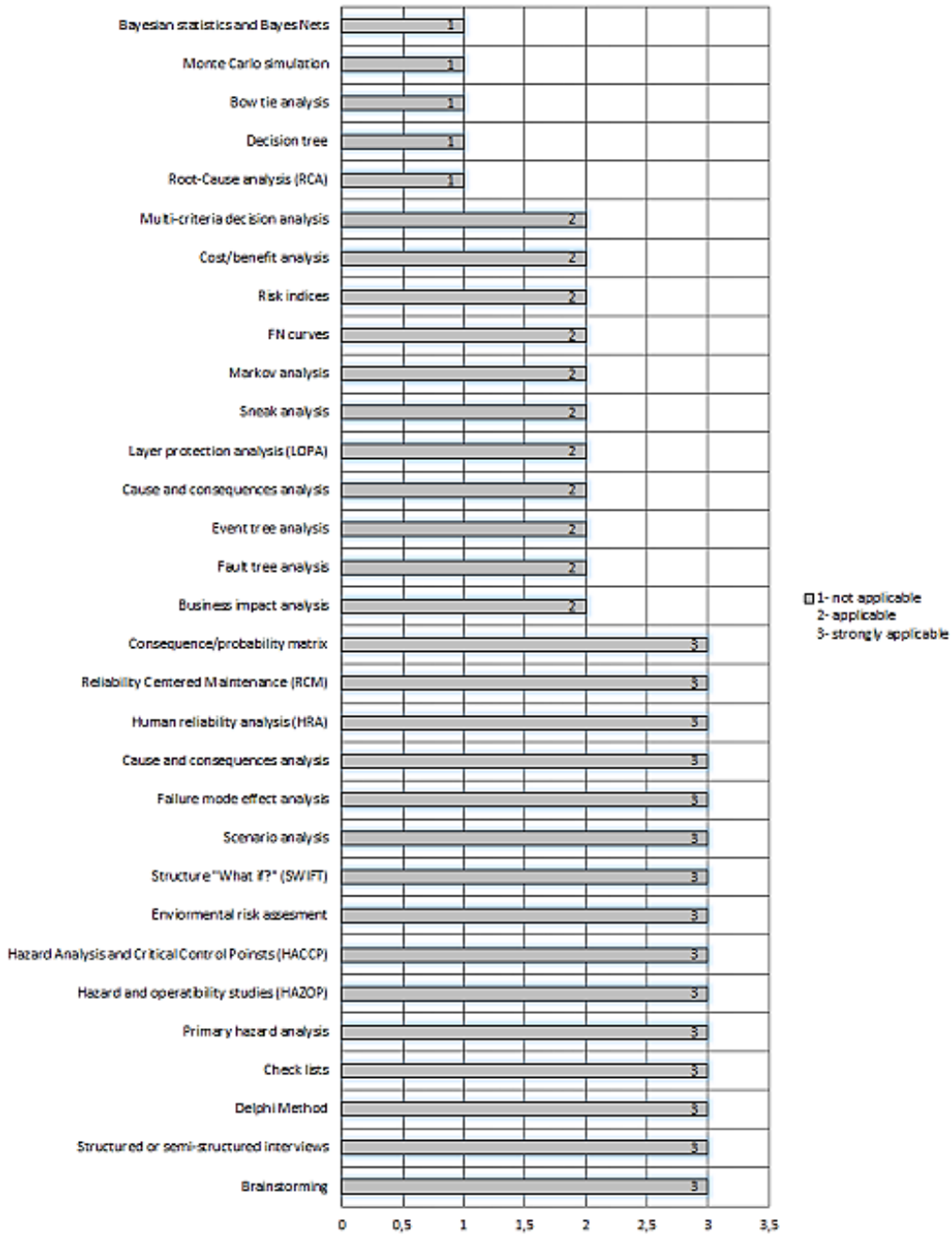


Figure 3. The Risk Management Process according to ISO 31000 (2009)

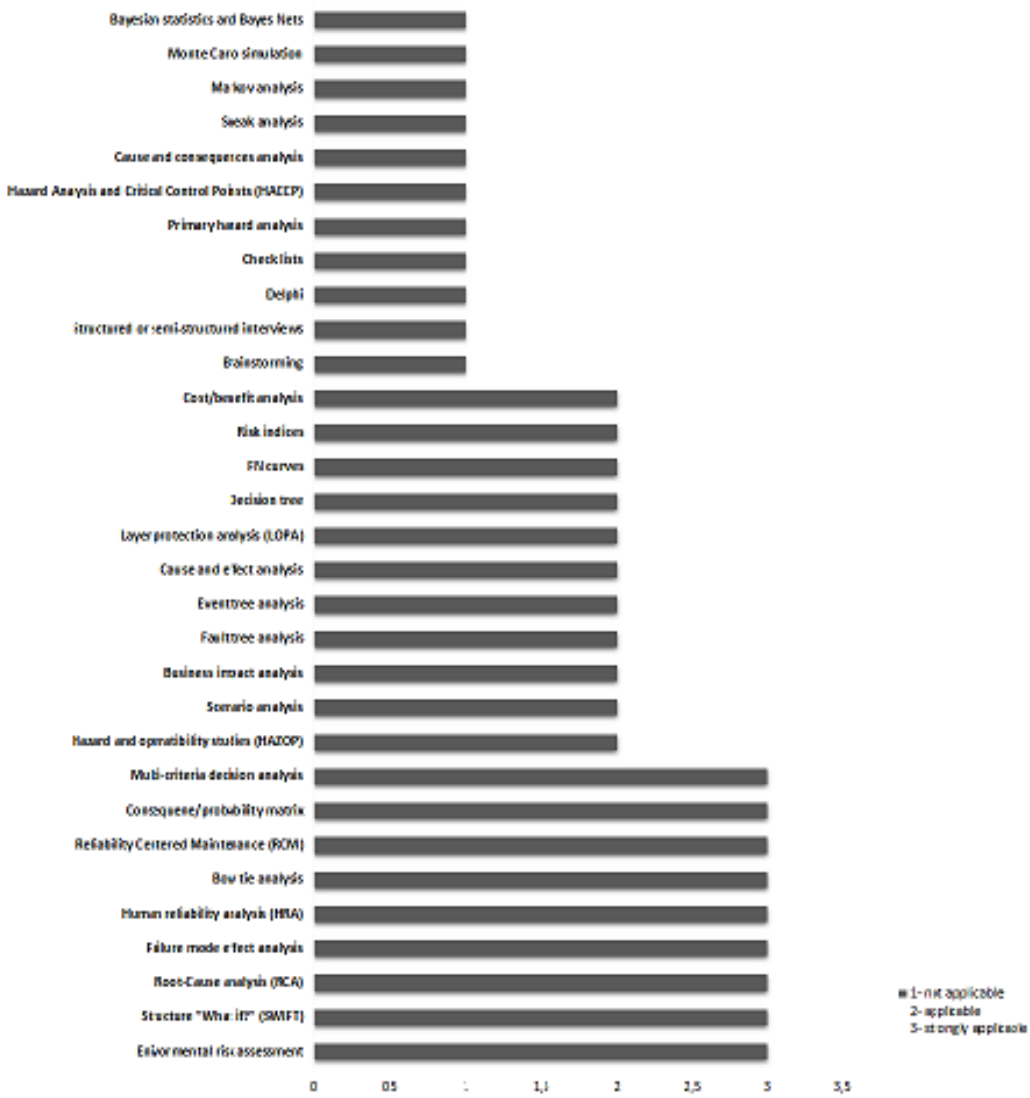
Determining the context involves identifying the external, internal, and risk management context in which the rest of the process will be performed, as well as determining the criteria for risk assessment and defining the structure of the analysis. Determining the risk determines the place, the time, the reason and the way of events that could prevent, reduce, delay or increase the achievement of the goals. Risk analysis addresses the areas of potential consequences and possible ways in which it may occur. Risk assessment includes a comparison of the estimated levels of risk with previously established criteria and a comparison between potential benefits and adverse results, making it possible to decide on the extent and nature of the required processing and on the priorities. Risk processing should include the design and implementation of effective strategies and plans that will result in a reduction in potential costs and increase of potential benefits. In order to ensure that the risk management process does not become a goal for itself, it is also necessary to monitor and review the effectiveness of all the steps of risk management, continuous improvement as well as risk monitoring and processing efficiency. Following the above mentioned, risk management should create values, be an integral part of the organizational process, be part of the decision-making, systematically and structured, based on available information. Certainly the human factor must be taken into consideration, be dynamic, respond to change, and in particular be capable of continuous improvement and be adaptive (ISO 31000:2009).

Methods for risk assessment are defined by ISO 31010 (ISO.IEC 31010: 2009, 2009), and for theoretical contribution to this discussions, the following graph shows the methods according to the degree of applicability in the risk identification phase (Graph 1).

As can be seen (Graph 1), in the risk identification phase, it is useful to use methods such as Brainstorming, Delphi Method, Primary Hazard Analysis or, for example, Consequences/Probabilities matrix method. When it comes to determining the risk level in the risk analysis phase according to ISO 31000: 2009 (ISO31000: 2009, 2009), the situation looks different (Graph 2).

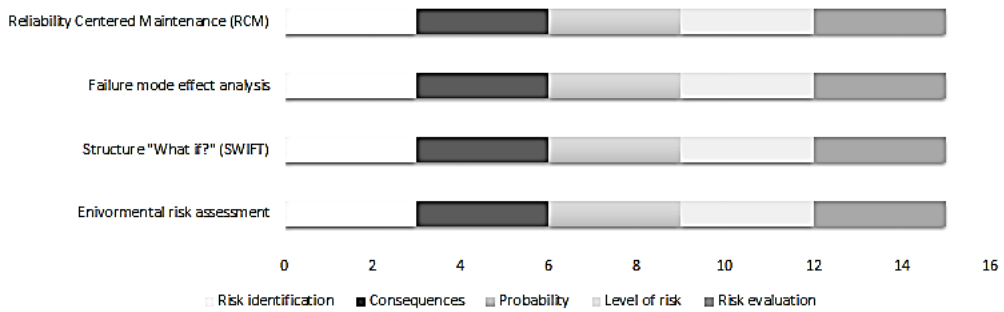


Graph 1. Review of risk assessment methods according to degree of applicability at risk identification stage created by authors based on anylysis of ISO 31000 (2009).



Graph 2. Review of risk assessment methods according to the degree of applicability to determine the level of riskcreated by authors based on analysis of ISO 31000 (2009)

When considering the level of risk assessment in the phase of risk analysis, it can be seen that several methods such as Human Reliability Analysis (HRA), RCA Analysis, Failure mode effect analysis and others are highlighted. However, further analysis outlined methods that have a high degree of applicability to all the observed criteria or risk assessment stages: Risk identification, Consequences, Probability, Level of risk and Risk evaluation, which are visible in the following graph (Graph 3).



Graph 3. Review of methods with the highest degree of applicability at all stages of risk assessmentcreated by authors based on analysis of ISO 31000 (2009)

The Structure What-If Analysis (SWIFT) is primarily intended for the assessment of hazards in the chemical and petrochemical industry and involves the analysis of known risks and hazards, takes into account the experience and incidents that have occurred and regulatory requirements and limitations. As a product output, the Risk Catalogue is dealt with by the importance of risk that is the basis for risk treatment. RCM is a method of defining and implementing policies to manage errors and failures to achieve adequate system security, reliability, availability and cost-effectiveness of all equipment. During the risk analysis, an estimation is made for frequency of errors and failures in conditions where there is the lack of maintenance. As output product there are information on condition monitoring, planned system overhaul, replacement of parts, search for defect and unavoidable maintenance provided. Failure mode and effects analysis or Cause and effect analysis is a technique used to determine the ways in which systems and processes do not meet the purpose for which they are intended. It is used as a traditional reliability analysis and identifies potential errors in system components, fault mechanisms and ways of avoiding them, and the effects of system failure, and there are four types of FMEA systems, design, processes and services. As output information, there is a list of errors, irregularities and effects that cause individual component errors, a list of consequences for the entire system, and if there are errors and impact frequency data, then quantitative results can also be obtained. These methods should also include the HRA (Human Reliability Analysis) and Consequence/probability matrix, which show a high degree of applicability for all criteria except for the risk.

4. Risk management in the supply chain

When it comes to managing supply chain risks, it is necessary to mention the definitions of some basic concepts that are closely related to this process. Thus, the term vulnerability can be defined as the existence of random disturbances that lead to deviations from the normal, expected or planned state in the supply chain activity, which may have negative consequences (Colicchia et al., 2010). A more simple definition states that the vulnerability is an unexpected deviation from the expected in the form of negative consequences (Pettit et al., 2010). Disruption is a disturbance or error that affects the continuity of an activity, that is, a combination of unwanted events occurring within the supply chain or its environment and the consequence of those events that pose a significant threat to the normal running of business processes in companies which are part of the supply chain (Wagner & Bode, 2008). Hazard refers to an incident associated

with a risky event, and the consequence of such an incident on the supply chain depends on the characteristics of the incident itself and the shape of a given supply chain (Thun & Hoenig, 2011). Failure refers to a risky event that as a result of the existence of risk sources and risk drivers occurred and has caused certain consequences on the observed supply chain (Tuncel & Alpan, 2010), and can be said that failures are events that can be considered triggers which lead to interruptions (Melnyk et al., 2009). A review of literature dealing with risks in the supply chain also contains different definitions.

According to some authors (e.g. Jüttner et al., 2003; Manuj & Mentzer, 2008; Faisal et al., 2007), risks represent the variability of distribution of possible outcomes in supply chains while others consider negative deviations of the expected values that contribute to the unwanted effects of active deviations of expected performance values that contribute to the creation of unwanted consequences (Wagner & Bode, 2008). The supply chain risks are also defined as events that may lead to deviations from planned outcomes and targeted achievements, that is to say, events with negative economic consequences (Tummala & Schoenherr, 2011; Norrman and Jansson, 2004). Juttner et al. (2003) define risk in supply chains as all risks of information, material and flow of products from the original supplier to final product delivery to the final consumer, and their basic concept of risk management in the supply chain is illustrated in the following figure (Figure 4).

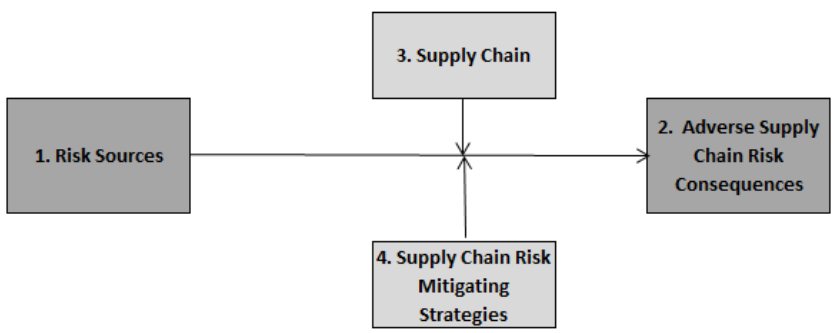


Figure 4. Supply Chain Risk Management Process according to Juttner et al. (2003)

From the existing literature there are two perceptions of the concept of risk noticeable. The first one perceives risk at the business context as a form of negative events affecting the functioning of the system and the second one, observes risk on the basis of the application of decision theory in conditions of increased uncertainty where the risk is seen as uncertainty. It should be said that risk management is a very complex activity. Managing risks in supply chains certainly confirms this claim since it is an activity that takes into account a large number of dimensions, a very wide spectrum of circumstances by which the supply chain is exposed and implementing extremely demanding procedures as well. According to Waters (2007), in managing supply chain risks, it is necessary to take account of trade-off between the need for a higher degree of efficiency and the higher degree of supply chain vulnerability associated with the introduced methods for increasing operational efficiency, which often does not take into account the risks that it entails. Therefore, according to Mircetic et al. (2016), it is necessary to establish such a form of logistical equilibrium that aims at providing the least supply chain vulnerability while simultaneously improving its efficiency as shown in the following figure (Figure 5).

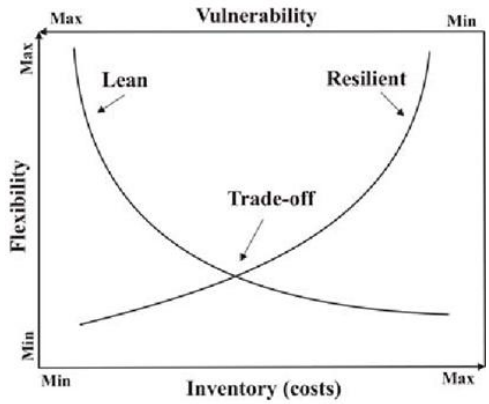


Figure 5. Logistical Balance according to Mircetic et al. (2016)

Furthermore, supply chain risk management should not be identified with crisis management, which occurs after the occurrence of a risky event. According to Waters (2007), the company's proactivity in risk management and the readiness of companies to occurrence of risk events is important, with a special emphasis being placed on quantifying all risks to which the company is exposed. However, there is an interesting phenomenon. Although many companies are aware of the risks in the supply chain and have carried out certain activities in the direction of preparation, they still invest too little time and resources in risk management in supply chains (Zsidisin et al., 2004). Research by Computer Sciences Corporation in 2003 showed that 43% of companies reported that their supply chains were susceptible to interruptions, and even 55% of surveyed companies had no documented plans for threat situations (Tang, 2006). Data obtained in later years confirm the existence of this phenomenon. According to Thun and Hoenig's research (2011), even 40% of companies considering themselves when it comes to supply chain risks highly vulnerable, and more than 75% of managers consider the vulnerability of their supply chain to be low. Some authors (e.g. Zsidisin et al., 2004) see the reasons for this behaviour in the risk underestimation because of the lack of accurate supply chain risk assessment, an ignorance in supply chain risk management, as well as in imprecise estimates of the likelihood of major interruptions owing to which many companies are unable to perform cost/benefit analysis to justify risk reduction plans. However, the fact is that the risks in the supply chain are numerous, ranging from minimal delays in delivery until the complete supply chain interruption. Particularly significant sources of risk may be activities that are carried out with a view to improving the supply chain's operation to achieve a higher level of efficiency without taking into account the associated risks.

Thus, the concept of risk in the supply chain can be defined as exposure to risky events that have a negative impact on the supply chain's operation - the level of service to the user, costs or the possibility of rapid response (Tummala & Schoenherr, 2011). In doing so, it is certainly important to identify the sources of risk. Some authors (e.g. Rao & Goldsby, 2009), among the sources of supply chain risks include factors of the environment, industry, organization, problem specificities and decision makers. Pujawan and Geraldin (2009) systematize risk events based on business process planning, procurement, production, delivery and feedback processes. Tummala and Schoenherr (2011) systematize risk triggers based on specifically defined risk categories such as are the risks of demand, delays, interruptions, inventories, interruption of production, physical capacity, procurement, systemic risks and legal and

transport risks. It can be said that the risks of supply chains are numerous and many authors have dealt with the definition of the type of risk in the supply chain. So, Christopher (1998) differentiates four types of supply chain risks: supply, demand, environment, and operational risks. Furthermore, other authors (Christopher & Peck, 2004; Manuj & Mentzer, 2008), differentiate between the risks of procurement, demand, operational and security risks, while Knemeyer et al. (2008) classify them differently in four groups based on the likelihood of events and the size of the consequences, as shown in the following figure (Figure 6).

Juttner et al. (2003) observe the risks from the aspect of organization, network, and environment. Some of the supply chain risks are shown in the following table (Table 1).

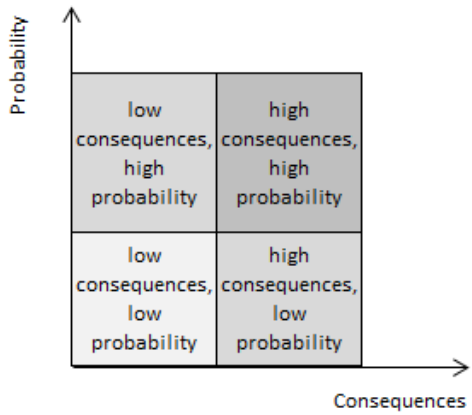


Figure 6 Types of risks by the magnitude of consequences and probability of occurrence. Risk categorizationsuggested by Knemeyer et al. (2008)

Table 1. List some of the risks in the supply chain created by authors, based on available literature

Internal risks	Stock risks	Delivery risks
High probability/minor consequences risks	System risks	Delayed risks
High probability/major consequences risks	Social risks	Competition risks
Low probability/minor consequences risks	Strategic risks	Product quality risks
Low probability/great consequences risks	Exchange rate risks	Location risks
Dangers caused by human factor	Technological risks	risks of poor quality of service
Operational risks	Transport risks	risks of mutual relationships
Organizational risks	External risks	Purchase risks
Political risks	Receivable risks	Disaster risks
Legal risks	risks of demand	Decision-making risks
Limited capacity risks	Property related risks	Occasional event risks
Environmental risks	Backflow risks	Short-term risks
Planning risks	Reputational risks	Qualitative risks
Prediction risks	Resource risks	Quantitative risks

If the impact of a risky event is observed from a quality point of view, it can be said that the result of a risky event is the reduction of the quality of service to end users, while the consequences of a risky financial event are reflected in financial losses and from the late-term aspect (Banisalam,2008). The consequences of severity-threatened events can be categorized as negligible, marginal, critical and catastrophic (Tummala and Schoenherr, 2011). Gaonkar and Viswandadhama (2007) on the consequences of risky events are looking in the context of the size of changes in supply chain structures (Table 2). However, all of the consequences of risky events in the supply chain certainly reduce the competitiveness of the enterprise, which is necessary for survival in very demanding market conditions.

Table 2. Types of consequences of risky events according to Gaonkar and Viswandadhama (2007)

Type of consequences of risky event	Description of the consequences of risky event	Influence of the consequences of a risky event on the supply chain
Deviation	The deviation that occurs when parameters such as lead time, cost, demand and supply deviate from their average value	There is no change in the supply chain structure.
Disturbance	Disorders that occur due to the unavailability of some of the supply chain components such as manufacturing, supply or logistics disorder due to unforeseen events caused by human or natural factors.	Radical transformation of the supply chain structure.
Catastrophe	A catastrophic event that occur as a result of overall system-level disruption. Finally, and worse, disaster is temporarily irreparable to close the supply chain network due to the overall system-level disruption.	Temporary irreparable closing the supply chain

When it comes to the characteristics of risky events in supply chains, they are always observed in the terms of probability and frequency of events and their impact.

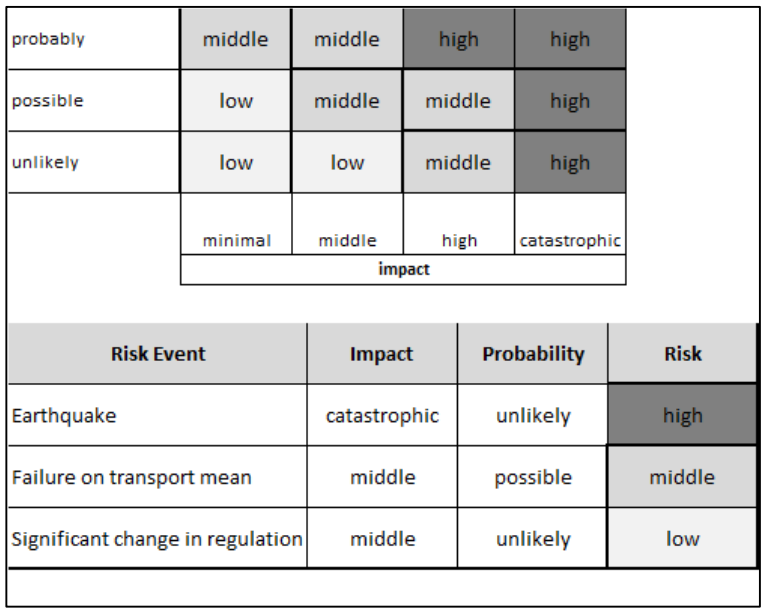
However, what can not be forgotten when it comes to supply chain risks is the importance of their measurability. Specifically, the problem of measurement can be particularly difficult when it comes to operational risks, which are numerous in the supply chain. One of the proposed ways of measuring risk in the supply chain is observation in the form of categories based on the size of the reduced value of logistic processes (Valjic et al., 2012).

When selecting between quantitative risk assessment based on the use of exact numerical values and qualitative estimates, the criterion of appropriateness should be applied.

Although under the conditions of the existence of exact data sometimes it is more appropriate to apply a quantitative risk assessment, when it comes to estimating the supply chain risk, where a significant number of operational risks are present, there are often situations when the cash value gained on the basis of accounting value does not represent the real value of a certain resource for certain process in the supply chain.

In addition, the application of quantitative risk assessment in the supply chain may be hindered in a number of situations where it is not possible to accurately, sometimes even approximate, to determine exposure factors as well as precision determination of probability.

An example of a simple scale for the qualitative assessment of the supply chain risk is shown in the figure below (Figure 7).
By analyzing the literature listed in Figure 10 (ISO 31000:2009; Paulsson,2007;Waters, 2007); Knemeyer et al., 2008; Tuncel and Alpan, 2010; Mircetic et al. 2016; Jüttner et al., 2018) dealing with supply chain risk management as well as the risk management process models in the supply chain, it is possible to note that many common elements such as risk identification, analysis, valuation, appropriate risk mitigation measures and some type of control over the whole process are present (Table 3).



Risk Event	Impact	Probability	Risk
Earthquake	catastrophic	unlikely	high
Failure on transport mean	middle	possible	middle
Significant change in regulation	middle	unlikely	low

Figure 7. An example of a simple scale for qualitative risk assessment of the supply chain created by authors

Table 3. An example of a simple scale for qualitative risk assessment of the supply chain created by authors based on literature listed in table

Elements									
Author of method	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
ISO 31000	+	+	+	-	+	+	+	-	+
Paulsson, 2007	+	+	+	-	+	+	+	-	+
Waters, 2007	+	+	+	-	-	-	+	-	+
Knemeyer et al., (2009)	-	+	+	-	+	-	-	+	+
Tummala and Schoenherr, 2011	-	+	+	-	-	-	+	-	+
Tuncel and Alpan, 2010	-	+	-	+	+	-	-	+	+
Norrman and Jansson, 2004	-	+	-	-	+	-	+	-	+
Juttner et al., 2003	-	+	-	-	+	-	+	-	-
Note: 1- Context, 2- Identification, 3- Analysis, 4 - Assessment, 5- Valuation, 6- Evaluation, 7- Treatment, 8- Measurement and implementation, 9- Monitoring and Control									

Choosing an adequate risk management system in the supply chain is certainly a demanding task. Each enterprise before implementing and deciding on a suitable system and all its components should explore all the complexities and uncertainties their supply chain is exposed to, as well as existing methods for supply chain risk management and on the basis of their own needs and capabilities, and choose the most appropriate one.

5. Conclusion

Globalization of business has brought significant changes in business processes in supply chain operations. On the one hand, the demand for end-user services is increasing, while on the other hand there is an increasing uncertainty both on the markets in general and on the markets related to supply chains. In such conditions, in the struggle to preserve market competitiveness, as a necessity, there

is a need in supply chain companies for more efficient supply chain management, which recognizes and implements the appropriate supply chain risk management system as one of the most important tools. Based on the analysis of secondary sources it is possible to confirm that implementing an adequate risk management system in the supply chain is necessary to maintain the competitiveness of the supply chain market.

While companies, as well as professional literature have recognized the importance of risk management in supply chains for the last twenty years, it can be said that there is still a significant amount of space for improvement in this area. Namely, in supply chain companies, it is noticed that after carrying out preparatory activities related to risk management, it is no longer investing time and resources in establishing an adequate risk management system.

Although many studies have shown that companies are aware of the exposure of their supply chains to many risks and a great number of managers considered them highly vulnerable, they faille to create documented plans for the occurrence of risky events. Reasons can be underlined in risk underestimation because of lack of accurate supply chain risk assessment, ignorance in supply chain risk management, as well as in imprecise estimates of the probability of major breakdowns, for which many companies are unable to carry out analyses to justify risk reduction plans. The existence of problems is also reflected in the many obstacles encountered when setting up a risk management system involving multiple companies, as there is still no commonly accepted common terminology nor a formal system for solving this problem. Of course, it is possible to say that a multidimensional approach to risk management in supply chains is necessary, an introduction of a serious risk management system within the enterprise as well as among all the supply chain operators, since frequent occurrences are not taken into account by individual chain members of indirect risks associated with the risky events of other members of the chain, consequences of which can be felt significantly.

Under the conditions of continuous introduction of new business models that respond to increased market demands for improving logistics efficiency and the consequent competitiveness of the company, it is appropriate to observe the concept of risk in supply chains as exposures to risky events that have a negative impact on the supply chain's operation - the level of service to the user or the fast response capability. The range of high-risk events that may affect the operation and consequently the supply chain's competitiveness is indeed great, ranging from events from the supply chain environment to internal events in companies involved in the supply chain. However, the supply chain that has implemented an adequate risk management system will have fewer negative consequences due to a greater possibility of timely recognition of risk and timely action in the direction of reducing negative effects.

Quality supply chain risk management includes a good assessment of the internal and external environment in which the company operates as well as an understanding of the likelihood of events and the consequence of potential events. Furthermore, the sensitivity of the supply chain to the observed events should be taken into account as well as developing appropriate risk reduction plans. Managing the supply chain risks should not be as a purpose in itself, but these plans need to be aligned with enterprise risk management plans as well as business goals.

Choosing an adequate risk management system in the supply chain is certainly a demanding task. Each enterprise should, before implementing and deciding on a suitable system and all its components, explore all the complexities and uncertainties their supply chain is exposed to, as well as existing methods of supply chain risk management and, on the basis of their own needs and capabilities, to choose the most appropriate. It is possible to confirm that the

efficiency of supply chain management is associated with the level and adequacy of the implemented risk management system aimed at maximizing the security of the transfer of the goods, services or information from the beginning to the end point of the destination, in order to increase the efficiency of the supply chain management with the level and adequacy of the implemented risk management system.

In conclusion it can be argued that supply chain management is integrating organizational units throughout the supply chain and coordinating of material, financial and flow information with competitiveness as the main driver in achieving ever greater efficiency and effectiveness. A successful response to these increasingly complex demands placed on suppliers of supply chains, which inevitably increase exposure to more and more complex risks, cannot in any way exclude the implementation of an adequate and high quality risk management system in the supply chain.

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